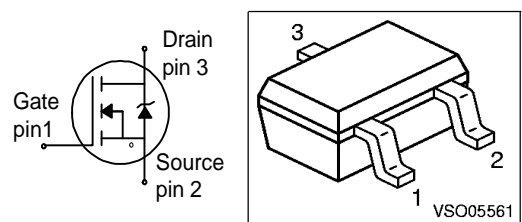


SIPMOS[®] Small-Signal-Transistor
Feature

- N-Channel
- Enhancement mode
- Logic Level
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21


Product Summary

| | | |
|--------------|------|----------|
| V_{DS} | 60 | V |
| $R_{DS(on)}$ | 5 | Ω |
| I_D | 0.23 | A |

PG-SOT-323


| Type | Package | Pb-free | Tape and Reel Information | Marking |
|---------|------------|---------|---------------------------|---------|
| SN7002W | PG-SOT-323 | Yes | H6327: 3000 pcs/reel | sSN |
| SN7002W | PG-SOT-323 | Yes | H6433: 10000 pcs/reel | sSN |

Maximum Ratings, at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Value | Unit |
|---|-----------------------|--------------|-------------------|
| Continuous drain current $T_A=25\text{ }^\circ\text{C}$ $T_A=70\text{ }^\circ\text{C}$ | I_D | 0.23 0.18 | A |
| Pulsed drain current $T_A=25\text{ }^\circ\text{C}$ | $I_{D\text{ puls}}$ | 0.92 | |
| Reverse diode dv/dt $I_S=0.23\text{A}$, $V_{DS}=48\text{V}$, $di/dt=200\text{A}/\mu\text{s}$, $T_{j\text{max}}=150\text{ }^\circ\text{C}$ | dv/dt | 6 | kV/ μs |
| Gate source voltage | V_{GS} | ± 20 | V |
| ESD class (JEDEC22-A114-HBM) | | 0 (<250V) | |
| Power dissipation $T_A=25\text{ }^\circ\text{C}$ | P_{tot} | 0.5 | W |
| Operating and storage temperature | T_j, T_{stg} | -55... +150 | $^\circ\text{C}$ |
| IEC climatic category; DIN IEC 68-1 | | 55/150/56 | |

Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|--|------------|--------|------|------|------|
| | | min. | typ. | max. | |
| Characteristics | | | | | |
| Thermal resistance, junction - ambient at minimal footprint | R_{thJS} | - | - | 250 | K/W |

Electrical Characteristics, at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit |
|--|---------------|--------|------|----------|---------------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| Drain-source breakdown voltage $V_{GS}=0, I_D=250\mu\text{A}$ | $V_{(BR)DSS}$ | 60 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=26\mu\text{A}$ | $V_{GS(th)}$ | 0.8 | 1.4 | 1.8 | |
| Zero gate voltage drain current $V_{DS}=60\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=60\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$ | I_{DSS} | - | - | 0.1 5 | μA |
| Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0$ | I_{GSS} | - | - | 10 | nA |
| Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=0.2\text{A}$ | $R_{DS(on)}$ | - | 4.1 | 7.5 | Ω |
| Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=0.23\text{A}$ | $R_{DS(on)}$ | - | 2.3 | 5 | |

Electrical Characteristics, at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Dynamic Characteristics

| | | | | | | |
|------------------------------|--------------|---|-----|------|-------|----|
| Transconductance | g_{fs} | $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 0.18\text{A}$ | 0.1 | 0.21 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$ | - | 34 | 45 | pF |
| Output capacitance | C_{oss} | | - | 7.2 | 9.6 | |
| Reverse transfer capacitance | C_{rss} | | - | 3 | 4.5 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 0.23\text{A}$, $R_G = 6\Omega$ | - | 2.4 | 3.6 | ns |
| Rise time | t_r | | - | 2.8 | 4.2 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 6 | 9 | |
| Fall time | t_f | | - | 8.5 | 12.75 | |

Gate Charge Characteristics

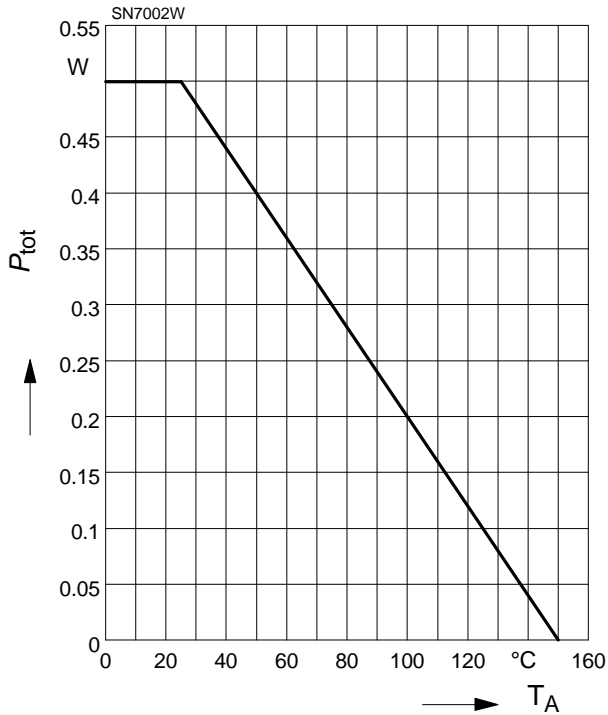
| | | | | | | |
|-----------------------|-----------------|--|---|------|------|----|
| Gate to source charge | Q_{gs} | $V_{DD} = 48\text{V}$, $I_D = 0.23\text{A}$ | - | 0.11 | 0.17 | nC |
| Gate to drain charge | Q_{gd} | | - | 0.42 | 0.63 | |
| Gate charge total | Q_g | $V_{DD} = 48\text{V}$, $I_D = 0.23\text{A}$, $V_{GS} = 0$ to 10V | - | 1 | 1.5 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD} = 48\text{V}$, $I_D = 0.23\text{A}$ | - | 3.4 | - | V |

Reverse Diode

| | | | | | | |
|--|----------|---|---|------|------|----|
| Inverse diode continuous forward current | I_S | $T_A = 25^\circ\text{C}$ | - | - | 0.23 | A |
| Inv. diode direct current, pulsed | I_{SM} | | - | - | 0.92 | |
| Inverse diode forward voltage | V_{SD} | $V_{GS} = 0$, $I_F = 0.23\text{A}$ | - | 0.85 | 1.2 | V |
| Reverse recovery time | t_{rr} | $V_R = 30\text{V}$, $I_F = I_S$, $di_F/dt = 100\text{A}/\mu\text{s}$ | - | 10.8 | 16.2 | ns |
| Reverse recovery charge | Q_{rr} | | - | 3.2 | 4.8 | |

1 Power dissipation

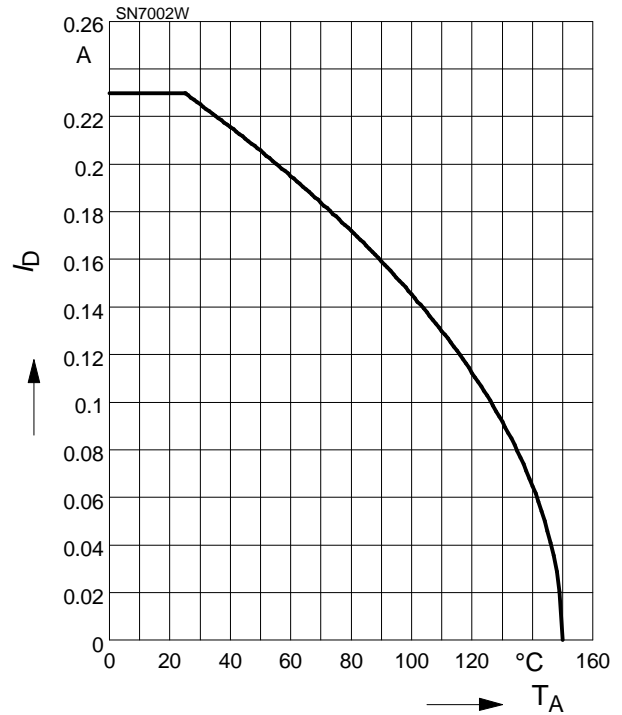
$$P_{tot} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

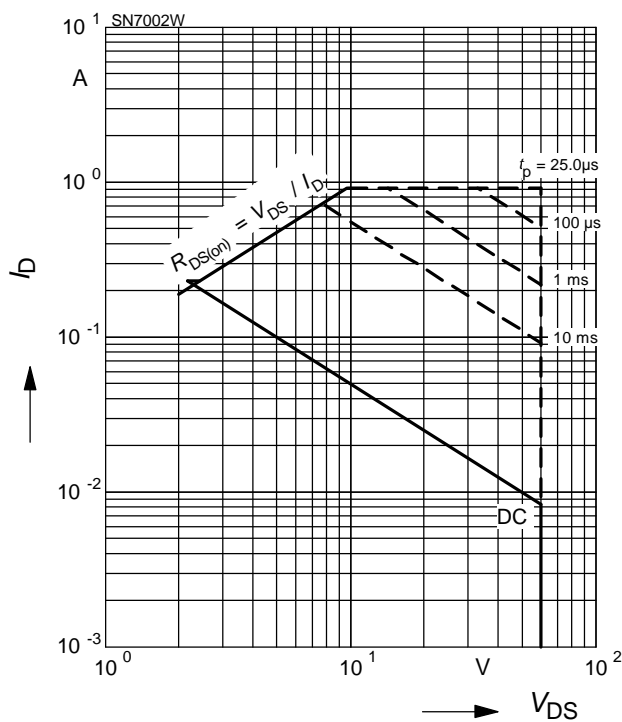
parameter: $V_{GS} \geq 10\text{ V}$



3 Safe operating area

$$I_D = f(V_{DS})$$

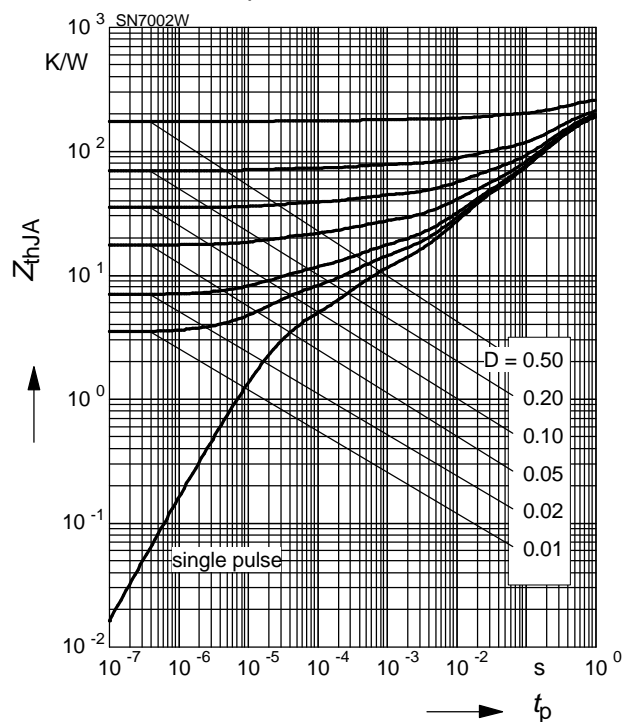
parameter: $D = 0$, $T_A = 25\text{ °C}$



4 Transient thermal impedance

$$Z_{thJA} = f(t_p)$$

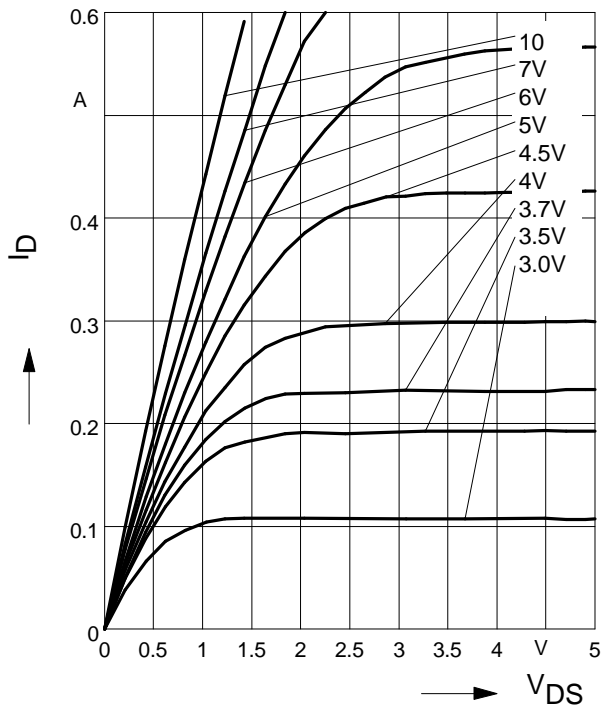
parameter: $D = t_p/T$



5 Typ. output characteristic

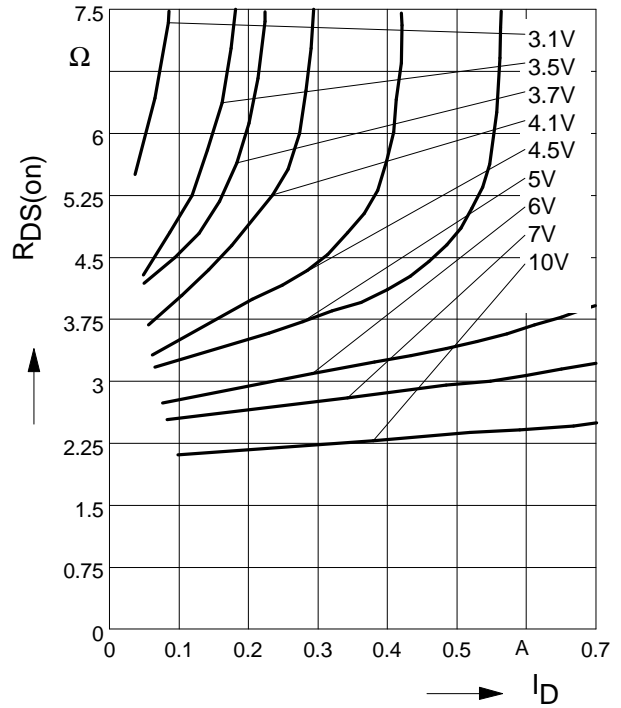
$$I_D = f(V_{DS})$$

parameter: $T_j = 25\text{ }^\circ\text{C}$, V_{GS}


6 Typ. drain-source on resistance

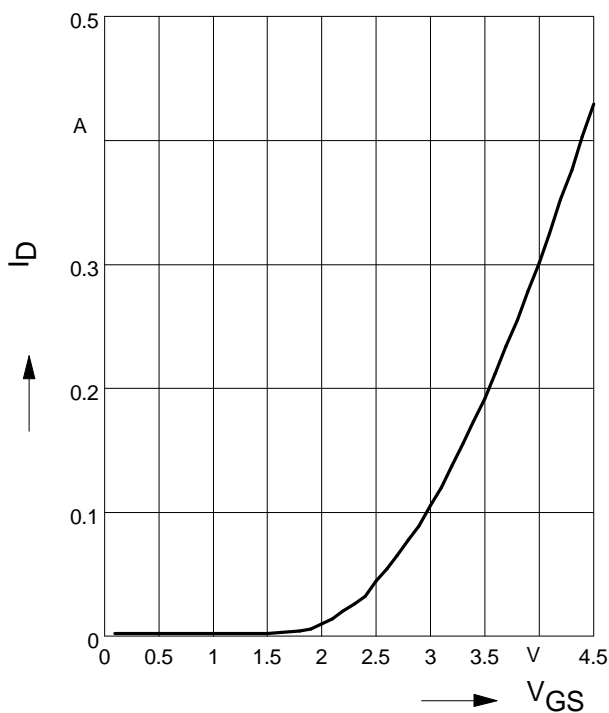
$$R_{DS(on)} = f(I_D)$$

parameter: $T_j = 25\text{ }^\circ\text{C}$, V_{GS}


7 Typ. transfer characteristics

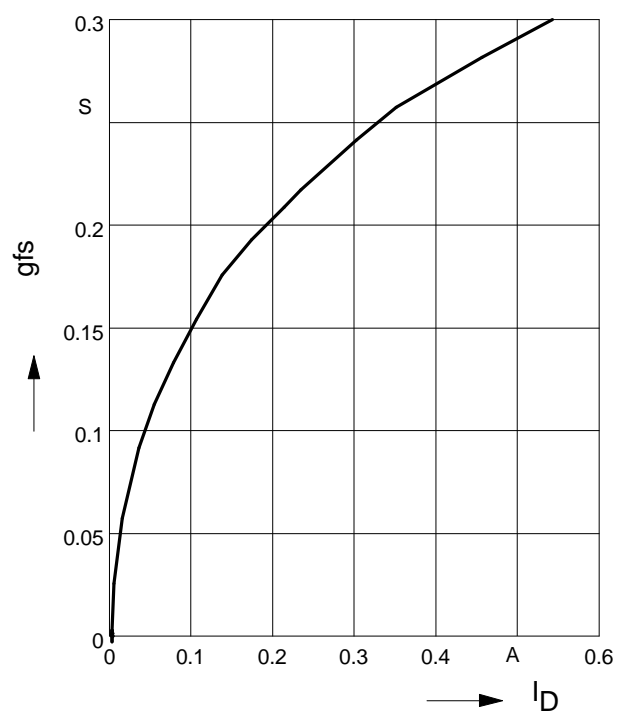
$$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

parameter: $T_j = 25\text{ }^\circ\text{C}$


8 Typ. forward transconductance

$$g_{fs} = f(I_D)$$

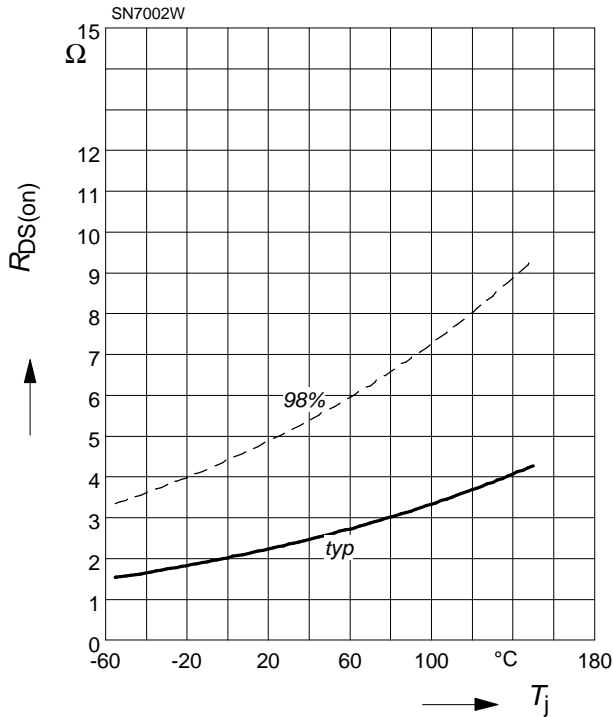
parameter: $T_j = 25\text{ }^\circ\text{C}$



(.) Drain-source on-state resistance

$$R_{DS(on)} = f(T_j)$$

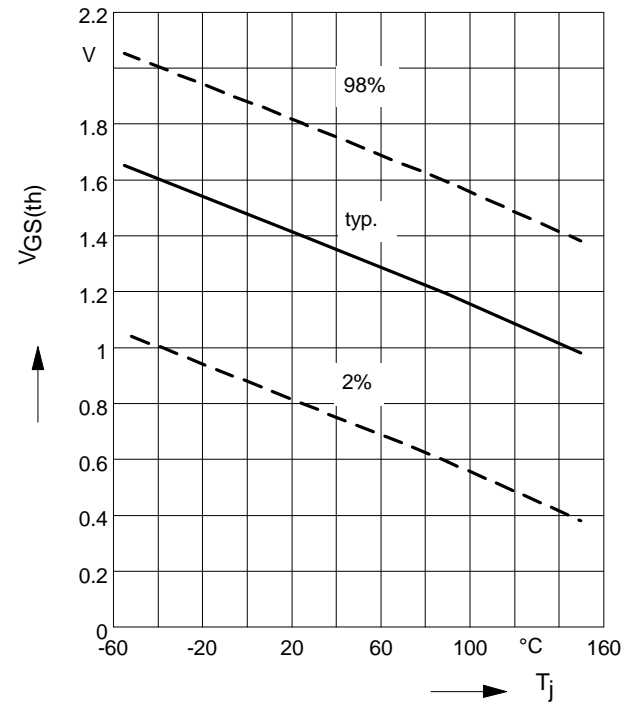
parameter : $I_D = 0.23 \text{ A}$, $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

$$V_{GS(th)} = f(T_j)$$

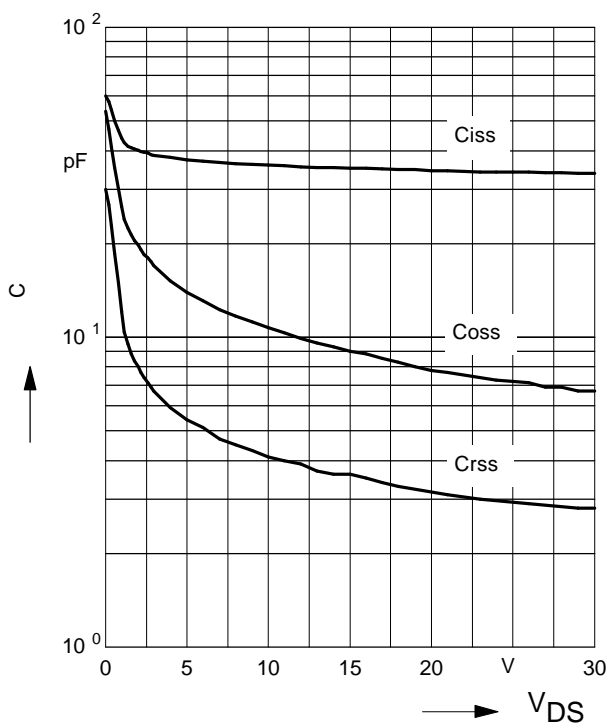
parameter: $V_{GS} = V_{DS}$; $I_D = 26\mu\text{A}$



11 Typ. capacitances

$$C = f(V_{DS})$$

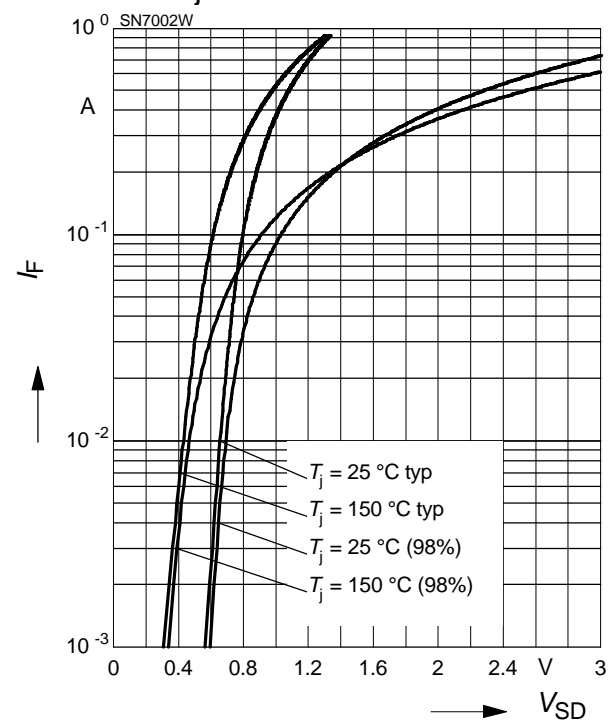
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$, $T_j = 25 \text{ }^\circ\text{C}$



12 Forward character. of reverse diode

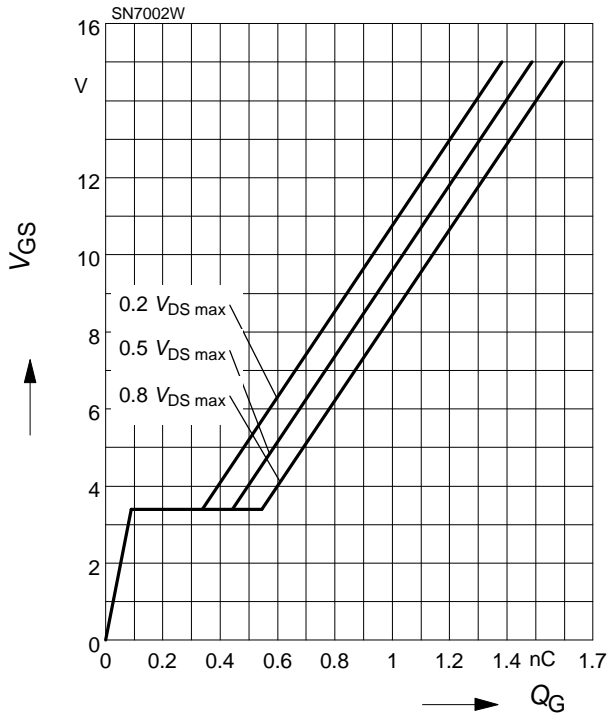
$$I_F = f(V_{SD})$$

parameter: T_j



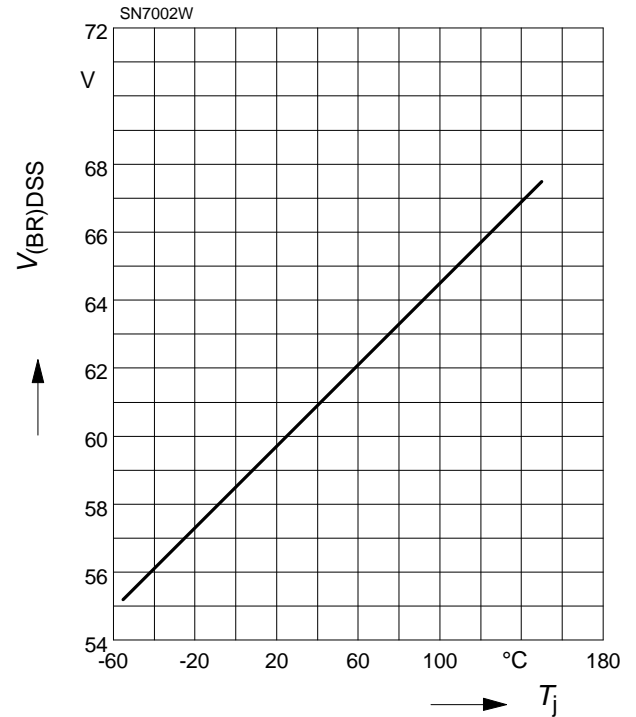
13 Typ. gate charge

$V_{GS} = f(Q_G)$; parameter: V_{DS} ,
 $I_D = 0.16$ A pulsed, $T_j = 25$ °C



14 Drain-source breakdown voltage

$V_{(BR)DSS} = f(T_j)$



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